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half of the bearings in two parts which fit together on cylindrical surfaces, the axis of these cylindrical surfaces being at right angles to the polar axis and passing through the center of the bearing. Lugs and holding-bolts serve to keep the two portions together. This device allows the bearings to adjust themselves, in altitude, to the polar axis. The adjustment of the bearings to the axis in azimuth can be accomplished by having a stout pin on the under side of the lowest section of the bearing, which turns in the base-plate. Such a system would make the bearing a universal joint through small arcs, and wholly self-aligning. Bolts for holding the bearing to the pier should of course be provided.

The bearing at the lower end of the polar axis can be made to take the thrust and at the same time be wholly self-aligning. This may be done by extending the cylindrical portions upward around the end of the axis so as to contain the line of thrust.

When both ends of the axis are supported from the same base-casting, the bearings are usually fixed. Even in that case there would probably be some advantage in using self-aligning bearings.

While the subject of this paper properly belongs to a different Section of the Association, it is perhaps of special interest to astronomers.

MT. HAMILTON, CALIFORNIA, November 30, 1903.

PLANETARY PHENOMENA FOR MAY AND JUNE, 1904.

BY MALCOLM McNEILL.

PHASES OF THE MOON, PACIFIC TIME.

Last Quarter, May 7, 3 ^h 50 ^m A.M.	Last Quarter, June 5, 9 ^h 53 ^m P.M.
New Moon, " 15, 2 58 A.M.	New Moon, " 13, 1 10 P.M.
First Quarter, " 22, 2 19 A.M.	First Quarter, " 20, 7 11 A.M.
Full Moon, " 29, 12 55 A.M.	Full Moon, " 27, 12 23 P.M.

The Sun reaches the solstice and summer begins on June 21st at about 1 P.M., Pacific time.

Mercury on May 1st is an evening star, setting about an hour and one half after sunset. It passed greatest east elonga-

tion on April 21st, and is drawing nearer to the Sun, so that it can be seen for only a few days at the beginning of the month. It passes inferior conjunction on the morning of May 13th, becoming a morning star, and moves rapidly away from the Sun, reaching greatest west elongation on June 8th. Its distance from the Sun is then $23^{\circ} 46'$, but it is 9° south of the Sun, and therefore the interval between the rising of the planet and of the Sun is not as great as it is at some greatest elongations. However, during all except the last few days of the month *Mercury* rises an hour or more before the Sun, and may be seen in the morning twilight if weather conditions are favorable. It is in close conjunction with *Mars* on May 9th, $0^{\circ} 21'$ north, and with *Venus* on May 22d, $1^{\circ} 53'$ south, but both conjunctions occur when the planets are rather too near the Sun to be made out without a telescope.

Venus is still a morning star, but is gradually drawing too near the Sun to be conspicuous. On May 1st it rises only forty minutes before sunrise, on June 1st only thirty-two minutes before, and on June 30th only eleven minutes before. It will be a very difficult matter to see *Venus* without a telescope after June 1st. It will pass conjunction and become an evening star during the night of July 7-8th. *Venus* and *Mars* are in conjunction at about midnight on June 18th, the former being $0^{\circ} 35'$ north, but, like the *Mercury* conjunctions, the planets are too near the Sun for easy view.

Mars is too near the Sun throughout the two-months period for naked-eye observations. At the beginning of May it is an evening star, setting only a little more than a half-hour after sunset. It passes conjunction with the Sun on May 30th and becomes a morning star. At the end of June it rises about forty minutes before sunrise. It will, however, scarcely be possible for it to be seen without a telescope, as it is at the same time at its maximum distance from the Earth for this revolution (238,000,000 miles), and consequently at its least brightness. For a year more, until it comes to its next opposition in 1905, it will gradually grow brighter, but it will not be at all conspicuous during the rest of 1904.

Jupiter passed conjunction with the Sun at the end of March, and by May 1st rises about an hour before sunrise. The interval increases, so that at the end of June it rises half

an hour after midnight. Its brightness is so great that it may be made out at the beginning of the two-months period. During May and June it moves 11° eastward and 4° northward in the eastern part of the constellation *Pisces*, rather a barren region of the sky.

Saturn is gradually moving around to a more convenient position for observation. It rises a little before 2 A.M. on May 1st, at about midnight on June 1st, and before 10 P.M. on June 30th. It is in the constellation *Capricorn*, and moves about 1° eastward until June 1st, and then begins to retrograde, reaching a position at the end of June almost the same as it had on May 1st.

Uranus is now getting into position for evening observation, rising before 11 P.M. on May 1st and at about half-past 6 on June 30th. It is in opposition on June 19th, and is then above the horizon throughout the night. It retrogrades or moves westward about 2° , and is in the western part of *Sagittarius*, a little north and west of the group known as "the milk-dipper."

Neptune is in the western sky in the evening, in the constellation *Gemini*. It reaches conjunction with the Sun on June 27th.

VARIABLE STARS.

BY ROSE O'HALLORAN.

V Cassiopeiæ.

1903. Eleven observations, distributed between the 17th of August and the 14th of September, showed that in a 4-inch lens this variable was on the verge of invisibility, which is generally the stage of 12th magnitude. Fainter stars are undiscernible except on very clear, calm nights. September 16—Much more distinct. October 12—Between 9th and 10th magnitude, and distinctly brighter than the star just adjacent to it.

Y Cassiopeiæ.

The last maximum of this star was observed as follows:—1903. August 27—Scarcely of 11th magnitude, but distinctly seen below *b*, classed as 10.2. August 31, September 2, 8, 9—Ditto. September 13—Nearly equal to *b*. September